

Agilent Ref: 10021090-1
United States Application Serial No. 10/693,064

AMENDMENTS

In the Claims:

1. **(Currently Amended)** An apparatus for the construction of one of a microscale and nanoscale device, comprising:
 - a first region comprising a diaphragm, the diaphragm comprising a first insulator material, the diaphragm having a top surface and a bottom surface,
 - a second region comprising a second insulator material laterally surrounding the first region and having an upper surface substantially flush with the bottom surface of the first region,
 - a substrate region comprising semiconductor material supporting the first region, the semiconductor material comprising a rigid frame laterally surrounding the diaphragm, **wherein the second region is positioned between a portion of the bottom surface of the first region and a portion of an upper surface of the substrate region,**
 - a substrate cavity region beneath the diaphragm,
 - a third region comprising a third insulator material, the third region being disposed atop the diaphragm, the third region being substantially thicker than the diaphragm and having a third cavity therethrough exposing a portion of the top surface of the diaphragm, the exposed portion of the top surface of the diaphragm being suitable for fabrication of one of a microscale and a nanoscale device.
2. **(Original)** A structure as recited in claim 1, wherein the one of a microscale and a nanoscale device comprises a first hole extending through the diaphragm.
3. **(Original)** A structure as recited in claim 1, wherein the one of a microscale and a nanoscale device comprises a nanopore.
4. **(Previously Presented)** A structure as recited in claim 1, wherein the second region is substantially thicker than the first region.

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5. **(Original)** A structure as recited in claim 1, further comprising a fourth region comprising a fourth insulator material disposed atop the third region, the fourth region being substantially thicker than the first region and having a fourth cavity therethrough exposing a portion of the top surface of the third region surrounding the third cavity.

6. **(Original)** A structure as recited in claim 1, further comprising a fifth material, the fifth material comprising a bottom layer portion of the diaphragm.

7. **(Original)** A structure as recited in claim 1, further comprising a sixth region comprising a sixth insulator material disposed atop the substrate region.

8. **(Currently Amended)** A structure as recited in claim 1, wherein the first region comprises one of a polymer, photoresist, SU8 photoresist, epoxy, polyimide, poly para-xylene, a silicone polymer, silicon dioxide, silicon nitride, silicon oxynitride, silicon-rich silicon nitride, TEOS oxide, plasma nitride, an insulator, a polymer, a semiconductor, and a metal.

9. **(Original)** A structure as recited in claim 1, wherein the first region comprises silicon nitride.

10. **(Currently Amended)** A structure as recited in claim 1, wherein the third region comprises one of a polymer, photoresist, SU8 photoresist, epoxy, polyimide, poly para-xylene, a silicone polymer, silicon dioxide, silicon nitride, silicon oxynitride, silicon-rich silicon nitride, TEOS oxide, plasma nitride, an insulator, a semiconductor, and a metal.

11. **(Currently Amended)** A structure as recited in claim 5, wherein the fourth region comprises one of a polymer, photoresist, SU8 photoresist, epoxy, polyimide, poly para-xylene, a silicone polymer, silicon dioxide, silicon nitride, silicon oxynitride, silicon-rich silicon nitride, TEOS oxide, plasma nitride, an insulator, a semiconductor, and a metal.

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12. **(Currently Amended)** A structure as recited in claim 5, wherein the fourth region comprises one of a polymer, photoresist, SU8 photoresist, epoxy, polyimide, poly para-xylene, a silicone polymer, silicon dioxide, silicon nitride, silicon oxynitride, silicon-rich silicon nitride, TEOS oxide, plasma nitride, an insulator, a semiconductor, and a metal.
13. **(Original)** A structure as recited in claim 1, wherein the diaphragm is from 50 nm to 500 nm in thickness.
14. **(Original)** A structure as recited in claim 1, wherein the diaphragm is about 200 nm thick.
15. **(Original)** A structure as recited in claim 1, wherein the third region is from 1 to 50 micrometers in thickness.
16. **(Original)** A structure as recited in claim 1, wherein the third region is about 2 micrometers thick.
17. **(Original)** A structure as recited in claim 4, wherein the second region is from 1 to 20 micrometers in thickness.
18. **(Original)** A structure as recited in claim 4, wherein the second region is from about 10 micrometers thick.
19. **(Original)** A structure as recited in claim 5, wherein the fourth region is from 1 to 50 micrometers in thickness.
20. **(Original)** A structure as recited in claim 5, wherein the fourth region is about 25 micrometers thick.

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21. **(Original)** A structure as recited in claim 1, wherein the semiconductor material comprises one of silicon, germanium, and gallium arsenide.

22. **(Currently Amended)** A structure as recited in claim 6 wherein the fifth material comprises one of a polymer, photoresist, SU8 photoresist, epoxy, polyimide, poly para-xylene, a silicone polymer, silicon dioxide, silicon nitride, silicon oxynitride, silicon-rich silicon nitride, TEOS oxide, plasma nitride, an insulator, a semiconductor, and a metal.

23. **(Currently Amended)** A structure as recited in claim 7 wherein the sixth material comprises one of a polymer, photoresist, SU8 photoresist, epoxy, polyimide, poly para-xylene, a silicone polymer, silicon dioxide, silicon nitride, silicon oxynitride, silicon-rich silicon nitride, TEOS oxide, plasma nitride, an insulator, a semiconductor, and a metal.

24. **(Original)** A structure as recited in claim 1, further comprising one of electrical leads and microfluidic leads, said lead being disposed at a location comprising one of beneath the third region, atop the third region, atop the fourth region, beneath the plane of the bottom surface of the diaphragm, and within the substrate cavity.

25. **(Original)** A structure as recited in claim 24, further comprising an electrical lead comprising one of a metal, a silicide, an organic conductor, a superconductor, aluminum, gold, platinum, palladium, iridium, copper, chromium, and nickel.

26. **(Currently Amended)** A structure as recited in claim 24, further comprising a microfluidic lead comprising one of a polymer, photoresist, SU8 photoresist, epoxy, polyimide, poly para-xylene, a silicone polymer, silicon dioxide, silicon nitride, silicon oxynitride, silicon-rich silicon nitride, TEOS oxide, plasma nitride, an insulator, a semiconductor, and a metal.

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27. – 34. (Canceled)

35. (Currently Amended) An apparatus for the construction of one of a microscale and nanoscale device, comprising:

a first region comprising a diaphragm, the diaphragm comprising a first insulator material, the diaphragm having a top surface and a bottom surface,

a second region comprising a second insulator material laterally surrounding the first region and having an upper surface substantially flush with the bottom surface of the first region,

a substrate region comprising semiconductor material supporting the first region, the semiconductor material comprising a rigid frame laterally surrounding the diaphragm, **wherein the second region is positioned between a portion of the bottom surface of the first region and a portion of an upper surface of the substrate region,**

a substrate cavity region beneath the diaphragm,

a third region comprising a third insulator material, the third region being disposed atop the diaphragm, the third region being substantially thicker than the diaphragm and having a third cavity therethrough exposing a portion of the top surface of the diaphragm, the exposed portion of the top surface of the diaphragm being suitable for fabrication of one of a microscale and a nanoscale device,

wherein the third insulator material provides for low-capacitance across the top surface of the diaphragm.

36. (Previously Presented) A structure as recited in claim 35, wherein the one of a microscale and a nanoscale device comprises a nanopore.

37. (Previously Presented) A structure as recited in claim 35, further comprising a fourth region comprising a fourth insulator material disposed atop the third region, the fourth region being substantially thicker than the first region and having a fourth cavity therethrough exposing a portion of the top surface of the third region surrounding the third cavity.

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38. (Previously Presented) A structure as recited in claim 35, further comprising a fifth material, the fifth material comprising a bottom layer portion of the diaphragm.

39. (Previously Presented) A structure as recited in claim 35, further comprising a sixth region comprising a sixth insulator material disposed atop the substrate region.

40. (Currently Amended) An apparatus for the construction of one of a microscale and nanoscale device, comprising:

a first region comprising a diaphragm, the diaphragm comprising a first insulator material, the diaphragm having a top surface and a bottom surface,

a second region comprising a second insulator material laterally surrounding the first region and having an upper surface substantially flush with the bottom surface of the first region,

a substrate region comprising semiconductor material supporting the first region, the semiconductor material comprising a rigid frame laterally surrounding the diaphragm, wherein the second region is positioned between a portion of the bottom surface of the first region and a portion of an upper surface of the substrate region,

a substrate cavity region beneath the diaphragm,

a third region comprising a third insulator material, the third region being disposed atop the diaphragm, the third region being substantially thicker than the diaphragm and having a third cavity therethrough exposing a portion of the top surface of the diaphragm, the exposed portion of the top surface of the diaphragm being suitable for fabrication of one of a microscale and a nanoscale device, and

a microfluidic lead, said lead being disposed at a location comprising one of beneath the third region, and atop the third region.

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41. (Currently Amended) An apparatus for the construction of one of a microscale and nanoscale device, comprising:

a first region comprising a diaphragm, the diaphragm comprising a first insulator material, the diaphragm having a top surface and a bottom surface,

a second region comprising a second insulator material laterally surrounding the first region and having an upper surface substantially flush with the bottom surface of the first region,

a substrate region comprising semiconductor material supporting the first region, the semiconductor material comprising a rigid frame laterally surrounding the diaphragm, **wherein the second region is positioned between a portion of the bottom surface of the first region and a portion of an upper surface of the substrate region,**

a substrate cavity region beneath the diaphragm,

a third region comprising a third insulator material, the third region being disposed atop the diaphragm, the third region being substantially thicker than the diaphragm and having a third cavity therethrough exposing a portion of the top surface of the diaphragm, the exposed portion of the top surface of the diaphragm being suitable for fabrication of one of a microscale and a nanoscale device, and

a fifth material, the fifth material comprising a bottom layer portion of the diaphragm.

42. (Currently Amended) An apparatus for the construction of one of a microscale and nanoscale device, comprising:

a first region comprising a diaphragm, the diaphragm comprising a first insulator material, the diaphragm having a top surface and a bottom surface,

a second region comprising a second insulator material laterally surrounding the first region and having an upper surface substantially flush with the bottom surface of the first region,

a substrate region comprising semiconductor material supporting the first region, the semiconductor material comprising a rigid frame laterally surrounding the diaphragm, **wherein the second region is positioned between a portion of the**

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bottom surface of the first region and a portion of an upper surface of the substrate region,

a substrate cavity region beneath the diaphragm,

a third region comprising a third insulator material, the third region being disposed atop the diaphragm, the third region being substantially thicker than the diaphragm and having a third cavity therethrough exposing a portion of the top surface of the diaphragm, the exposed portion of the top surface of the diaphragm being suitable for fabrication of one of a microscale and a nanoscale device, and

a sixth region comprising a sixth insulator material disposed atop the substrate region.